Claims:

1. A data transmission apparatus used in a multiple service ring including at least two nodes coupled to at least one aggregate pipe and at least one tributary, said apparatus comprising:

a tributary TX framer coupled to said tributaries for converting data received from said tributaries into XP(processing protocol) data packets;;

transmission setup means for setting-up information indicating the destination node address and destination tributary for XP packets to be transmitted;

a TX framer for encapsulating said information indicating the destination node address and destination tributary and the XP packets into frames of the multiple service ring and transmitting the same along an aggregate pipe to a downstream neighbor node in the ring;

a RX framer for receiving and deframing data frames of the multiple service ring from a upstream neighbor node along an aggregate pipe to obtain at least a destination node address and XP packets;

transiting means for transiting the frames destined to other nodes to said TX framer so as to forward the frames destined to other nodes to a next node;

a destination tributary determining means for determining a destination tributary of the XP packets for local node; and

a tributary RX framer for converting said XP packets for local node from the RX framer into data of format of local tributary and sending the local tributary data to a corresponding tributary determined by said destination tributary determining means.

2. The data transmission apparatus according to claim 1, wherein said transiting means transits the frames destined to other nodes at a fast and almost fixed rate.

3. The data transmission apparatus according to claim 1, wherein said multiple service ring is based on RPR Lite, and said Rx framer is RPR MAC Rx framer and said Tx framer is RPR MAC Tx framer.

4. The data transmission apparatus according to claim any one of claims 1 to 3, wherein said destination tributary determining means includes a discriminator for determining whether said received packets for local node are unicast, multicast or broadcast; a tributary member copying means for making copies of the packets for each of the corresponding tributary if multicast or broadcast is determined within a membership group in a node; and tributary identifier determining means for determining destination tributary from TT and TN fields in the received frames.

5. The data transmission apparatus according to claim 4, wherein said transmission setup means sets up destination node address(NA), and TT and TN fields for indicating the type and NO. of the destination tributary.

6. The data transmission apparatus according to claim 5, further comprising a Tx schedule unit for scheduling the transmission of data frames according to a priority of the frames, and decide which frame will go first to the downstream along the ringlet.

7. The data transmission apparatus according to claim 6, further comprising a TTBP unit for performing tributary based protection to provide at least one tributary to be used as a standby in case of failure of the used tributaries.

8. The data transmission apparatus according to claim 7, wherein said TTBP unit provides 1+1 TTBP to designate a mate Standby Tributary with the same service property, source and sink in which payloads of the mate Working Tributary and Standby Tributary carries the same traffic, and Once TTBP occurred for this working tributary, said standby will replace this working tributary within 50ms.

9. The data transmission apparatus according to claim 7, wherein said TTBP unit provides 1:1 TTBP to designate a mate Standby Tributary with the same service property, source and sink in which payloads of the Standby Tributary can run the other additional traffic, and once TTBP occurred for this Working Tributary, the additional traffic will be dropped out within 50ms.

10. The data transmission apparatus according to claim 7, wherein said TTBP unit provides 1:N TTBP to designate a mate Standby Tributary with the same service property, source and sink in

which payloads of the Standby Tributary runs the other additional traffic, and once TTBP in one of N Working Tributary occurred, this additional traffic will be dropped out within 50ms.

11. The data transmission apparatus according to claim 4, wherein said tributary includes bandwidth management unit with symmetry and asymmetry and tributary based filter targeting at one or more fields of MAC frame, XP frame, IP packet or TCP/UDP packet.

12. The data transmission apparatus according to claim 11, wherein said MSR does not use Fairness arithmetic and uses either a local or a global node address, and pre-plan strategy.

13. The data transmission apparatus according to claim 5, further comprising a frame sequence number generator for generating frame sequence number sequentially with respect to a specified modulus for each of the data frames to be transmitted at the transmitting side ; and

at the receiving side, a FSN extractor for extracting a FSN with respect to a peer-to-peer modulus from the received data frames; a counter at the receiving side for counting the number of the received data frames; and a comparator for comparing the counted frame number with the extracted FSN, if mismatch, an error reflecting transport performance is indicated.

14. The data transmission apparatus according to claim 13, wherein said destination tributary determining means gets TT, TN, a value of CS&NM and FSN from the received frames from the upstream node, and said transmission setup means attaches TT, TN, a value of CS&NM and FSN into the data frames to be transmitted.

15. The data transmission apparatus according to claim 14, wherein said RPR framer, and the transiting means are of IEEE802.17 MAC layer; said tributary RX framer, said transmission setup means, and said destination tributary determining means, said FSN generator, FSN extractor, counter, and comparator are of the XP layer, and said tributary TX framer is of tributary processing layer.

16. The data transmission apparatus according to claim 15, wherein said tributary processing layer further comprises a tributary adaptation function unit for said signal and rate transform, synchronous function between two sides of peer to peer.

17. A data transmission method used in a multiple service ring including at least two nodes coupled to at least one aggregate pipe and at least one tributary, said apparatus comprising:

receiving data from a tributary and converting the received data into XP(processing protocol) data packets;;

setting-up information indicating the destination node address and destination tributary for XP packets to be transmitted;

encapsulating said information indicating the destination node address and destination tributary and the XP packets into frames of the multiple service ring and transmitting the same along an aggregate pipe to a downstream neighbor node in the ring;

receiving and deframing data frames of the multiple service ring from a upstream neighbor node along an aggregate pipe to obtain at least a destination node address and XP packets;

transiting the frames destined to other nodes so as to forward the frames destined to other nodes to a next node;

determining a destination tributary of the XP packets for local node; and

converting said XP packets for local node into data of format of local tributary and sending the local tributary data to a corresponding tributary determined by said destination tributary determining step.

18. The data transmission method according to claim 17, wherein said transiting step transits the frames destined to other nodes at a fast and almost fixed rate.

19. The data transmission method according to claim 17, wherein said multiple service ring is based on RPR Lite, and said Rx framer is RPR MAC Rx framer and said Tx framer is RPR MAC Tx framer.

20. The data transmission method according to any one of claims 17 to 19, wherein said destination tributary determining step includes a discriminating step for determining whether said received packets for local node are unicast, multicast or broadcast; a tributary member copying means for making copies of the packets for each of the corresponding tributary if multicast or broadcast is determined within a membership group in a node; and tributary identifier determining means for determining destination tributary from TT and TN fields in the received frames.

21. The data transmission method according to claim 20, wherein said transmission setup step sets up destination node address(NA), and TT and TN fields for indicating the type and NO. of the destination tributary.

22. The data transmission method according to claim 21, further comprising a Tx scheduling step before the TX framing step for scheduling the transmission of data frames according to a priority of the frames, and decide which frame will go first to the downstream along the ringlet.

23. The data transmission method according to claim 22, further comprising a TTBP step for performing tributary based protection to provide at least one tributary to be used as a standby in case of failure of the used tributaries.

24. The data transmission method according to claim 23, wherein said TTBP step provides 1+1 TTBP to designate a mate Standby Tributary with the same service property, source and sink in which payloads of the mate Working Tributary and Standby Tributary carries the same traffic, and Once TTBP occurred for this working tributary, said standby will replace this working tributary within 50ms;

25. The data transmission method according to claim 23, wherein said TTBP step provides 1:1 TTBP to designate a mate Standby Tributary with the same service property, source and sink in which payloads of the Standby Tributary can run the other additional traffic, and once TTBP occurred for this Working Tributary, the additional traffic will be dropped out within 50ms.

26. The data transmission method according to claim 7, wherein said TTBP step provides 1:N TTBP to designate a mate Standby Tributary with the same service property, source and sink in which payloads of the Standby Tributary runs the other additional traffic, and once TTBP in one of N Working Tributary occurred, this additional traffic will be dropped out within 50ms.

27. The data transmission method according to claim 20, wherein said tributary includes bandwidth management with symmetry and asymmetry and tributary based filter targeting at one or more fields of MAC frame, XP frame, IP packet or TCP/UDP packet.

28. The data transmission method according to claim 27, wherein said MSR does not use Fairness arithmetic and uses either a local or a global node address, and pre-plan strategy.

29. The data transmission method according to claim 21, further comprising the steps of: generating frame sequence number sequentially with respect to a specified modulus for each of the data frames to be transmitted at the transmitting side ; and

at the receiving side, extracting a FSN with respect to a peer-to-peer modulus from the received data frames; counting the number of the received data frames; and comparing the counted frame number with the extracted FSN, if mismatch, an error reflecting transport performance is indicated.

30. The data transmission method according to claim 29, wherein said destination tributary determining step gets TT, TN, a value of CS&NM and FSN from the received frames from the upstream node, and said transmission setup step attaches TT, TN, a value of CS&NM and FSN into the data frames to be transmitted.

31. The data transmission method according to claim 30, wherein said RPR framing, and the transiting are performed in IEEE802.17 MAC layer; said tributary RX framing, said transmission setup step, and said destination tributary determining step, said FSN generating, FSN extracting, counting, and comparing steps are performedin the XP layer, and said tributary TX framing is performed in the tributary processing layer.

32. The data transmission method according to claim 31, wherein said tributary processing layer further comprises a tributary adaptation function for said signal and rate transform, synchronous function between two sides of peer to peer.